Bachelor of Science in Computer Science
May 2022

A comparison through heuristic evaluation of two MOOC platforms: Coursera and Udemy

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This thesis is submitted to the Faculty of Computing at Blekinge Institute of Technology in partial fulfilment of the requirements for the degree of Bachelor of Science in Computer Science. The thesis is equivalent to 10 weeks of full time studies.

The authors declare that they are the sole authors of this thesis and that they have not used any sources other than those listed in the bibliography and identified as references. They further declare that they have not submitted this thesis at any other institution to obtain a degree.

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Abstract

In recent years thousands of people worldwide have been using Massive open online courses (MOOCs) for various reasons, including career development and change, continuing education, lifelong learning, and training. MOOCs are free online courses that anyone can enroll in and are an affordable and flexible way to learn new skills, develop professionally, and provide quality educational experience across the globe. Having an exemplary user interface will make users prefer most MOOC platforms, which inspired this study to know which MOOC platform has usability and better user experience by using the survey evaluation.

The main objective of this study is to measure the usability components(effectiveness, efficiency, and overall user satisfaction level) to determine which MOOC platform, Coursera or Udemy, has a better user experience using the heuristic principles.

A quantitative research method has been used in this paper, which focuses on statistical, mathematical, and numerical analysis of data collected through surveys, questionnaires, and polls. In this paper, a questionnaire to determine user satisfaction through surveys has been developed. Usability has been evaluated for each MOOC platform (Coursera and Udemy) by calculating usability components. Statistical methods like variance and standard deviations has been calculated using the survey results.

Responses from the survey evaluation are collected and are graphically represented in bar graphs and pie charts. Respondent's timings and statistical method results are presented in a tabular form. The satisfaction level is calculated and represented in a Likert scale format.

The usability of two MOOC platforms (Coursera and Udemy) was measured by calculating usability components. Better user experience among Coursera and Udemy is measured using usability heuristic principles. This study concludes that effectiveness, efficiency, and satisfaction level while performing eight tasks given to the user is similar in both MOOC platforms (Coursera and Udemy). From the survey evaluation, the users preferred Udemy over Coursera.

Keywords: Heuristic principles, Massive open online courses (MOOCs), Survey evaluation, Usability, User experience.

Acknowledgments

We want to express our sincere thanks to our supervisor at BTH, Dr.Sai Prashanth Josyula, for his support and guidance throughout this thesis. We want to thank the students who helped us in our survey evaluation for the thesis. We want to thank our family for their emotional support. We want to thank our examiner, Dr.Prashant Goswami, who encouraged us every step. They sincerely believed in our work and helped us to complete this thesis. We want to thank all the people who encouraged us to complete this thesis.

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Chapter 1

Introduction

Today, one of the most advanced forms of distance education is the massive open online course (MOOC), which provides free access and intellectual innovation to students worldwide via the Internet and various technological advances [20]. The reach of educational institutions through the MOOC platforms continues to grow as more and more students seek to enroll in courses that are easily accessible to anyone in the world with an Internet connection [8].

Massive open online courses (MOOCs) are a disruptive trend in education. Most MOOCs are offered by dedicated online platforms such as Coursera, Udemy, Edx, and LinkedIn Learning, and most attract thousands of learners. However, the effectiveness of learning in many MOOCs is questionable, as evidenced by low student retention rates [18].

Studies show that most MOOCs have a completion rate of less than 7% [26]. There are several reasons for this lower performance, one of which is related to usability issues in terms of user experience. Usability is the ability of a particular user to use a system efficiently, effectively, and satisfactorily in a given user environment to achieve a particular goal [25]. Usability has a significant impact on student learning and the overall learning experience. Therefore, usability is an essential requirement for educational software.

Usability [4] is applied to improve the flexibility and ease of MOOC platforms using heuristics evaluation [15]. A survey will be conducted using heuristics principles to determine which platforms provide the best user experience. The usability heuristics used to survey the MOOC platforms are the following [16] [14]

1. Visibility of system status
2. Match between the system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetics and minimalistic design

9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

These are heuristics that have been used in traditional usability evaluations. Most evaluations incorporate these principles to solve usability problems [1] [9]. This study will help developers create a better platform for MOOCs or improve the existing platforms by following the heuristics and providing a better user experience [12]. This study will also help students choose the best platforms to improve their general and academic skills.

1.1 Aim and objectives

The thesis aims to evaluate user satisfaction based on usability heuristics between Coursera and Udemy by surveying long term (users who are using both platforms for an extended period) and new users (users who are new to both platforms).

1.1.1 Objectives

- To identify the heuristic problems on selected MOOC platforms based on a questionnaire survey.
- To measure the chosen MOOC platforms' effectiveness, efficiency, and satisfaction level.
- To calculate and compare the outcomes of the above platforms using statistical methods.

1.2 Research Questions

1. How effective, efficient and satisfactory are the two MOOC platforms (Udemy and Coursera)?

   Motivation: According to the ISO 9241-11 standard, usability is defined as *"The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use"* [3]. Therefore, usability consists of three significant aspects: effectiveness, efficiency, and satisfaction. Therefore, the primary motivation behind this research question is to find which MOOC platform is better in usability. This RQ can be achieved by assigning tasks to the users and calculating the effectiveness, efficiency and satisfaction level using statistical methods.

2. How does the user experience of two major MOOC platforms (Coursera and Udemy) compare to each other?

   Motivation: With the popularity of these MOOC platforms (Coursera and Udemy) and the increase in the number of courses, more universities are engaging in this form of online teaching and learning. At the same time, various

course choices create a larger pool of participants who are determined by their curiosity and interest in the course context. The platform's user experience can also be linked to increased student enrollment. This is the motivation for comparing the user experiences of both platforms, which will give the user an idea about which platform to choose. This can be achieved by conducting a questionnaires survey among the long-term users and new users of the specified MOOC platforms by using usability heuristic principles.

1.3 Background

1.3.1 Definition of Usability

Usability is a quality characteristic used to evaluate the ease of use of a user interface. The term "usability" also refers to improving usability during the design process [17].

Five quality factors that define usability are

Learnability: the ease with which users can perform basic tasks when new to the design.

Efficiency: How quickly users can complete tasks after learning the design.

Memorability: The ease with which users can improve their skills when re-familiarizing themselves with the design after not using it for a while.

Errors: How many mistakes the user makes, how serious they are, and how easily they can be corrected.

Satisfaction: To know the user's expectations or needs in any design.

1.3.2 Heuristic Principles

Heuristic evaluation is a usability method that examines a user interface to identify usability problems. Jakob Neilsen developed ten heuristics [16]to identify usability problems in user interfaces. These usability heuristics principles are described below.

1. Visibility of system status

Users need to be informed of what is happening in the system in a timely manner and through appropriate feedback. This approach allows the user to know the state of the system and the results of each interaction. The system should indicate the status at each stage of the interaction and communicate with the user to provide appropriate feedback.

2. Match between system and the real world

Interactive systems must communicate using words, phrases, and concepts known to the user rather than a system-oriented language. Information must follow real-world norms to appear logical and natural.

3. User control and freedom

Users can make mistakes when interacting with the system interface. Interactive systems must inform users that they should refrain from unnecessary actions that could delay the process. Systems must give users the ability to block or interrupt any program to give them flexibility and confidence. The exit point of an interactive

system allows the user to manipulate the system.

4. Consistency and standards

The system must not confuse users by using the same meaning in different phrases and situations. The system must comply with specific regulations and industry conventions. Consumers will spend less time on your digital products and be attracted to new products. Therefore, the mental pressure of users learning something new may increase due to consistency.

5. Error prevention

Error reporting is essential, but the best user interface design is about solving problems, not about what happens next. An interactive system should exclude or identify error-prone situations and inform the user before they are recognized.

6. Recognition rather than recall

Interactive systems should be designed to minimize the user's workload by developing options, elements, and actions that are visible to the user. Interactive systems must provide instructions and ideas that facilitate operation and efficient use. This concept implies that the system interface should allow the user to recognize information, rather than store it with them.

7. Flexibility and efficiency of use

This principle states that interaction with the system should be the same for novice and experienced users, and that experienced users should use keyboard shortcuts to accomplish tasks. Nevertheless, all users should be the same, as novices perform tasks in a standard way.

8. Aesthetics and minimalistic design

This principle states that an interactive system should develop useful information and not redundant irrelevant information. Unnecessary information can override important information and reduce the visibility of the content. Developers should identify important information that should be shown to users.

9. Help users recognize, diagnose, and recover from errors

This principle states that error messages should be expressed in human-understandable language and offer solutions to user errors. The aesthetics of error messages also play an important role in the design of the interface. Responses should be presented in an understandable form so that the user can correct the error.

10. Help and documentation

The system interface should be user-friendly and should not require additional explanation. However, appropriate documentation may be required to enable users to complete tasks. Help and documentation elements should be easy to find and help the user accomplish the task. Specific steps should be specified to assist the user in completing the task.

1.3.3 Coursera and Udemy

Coursera

Coursera was founded in 2012 by Daphne Koller and Andrew Ng to give a good learning experience to the students around the world. Today, Coursera is a global online learning platform that delivers online courses and degrees from leading uni-

versities and companies to anyone, anywhere. Coursera was certified by Corporation B in February 2021, which means not only legal accountability for shareholders, but also reduce barriers to access to a world-class education for all. Coursera partners with more than 200 leading universities and companies to bring flexible, accessible, work-related online learning to individuals and organizations around the world. User interface of coursera is attached in Appendix A.1

Udemy

Udemy founder Ellen Barry had little access to education until she got a computer. Changing her life through online learning, Ellen partnered with co-founders of Udemy to achieve a common goal of providing quality education to all. Udemy, guided by its mission, enables anyone, anywhere in the world, to create courses and sell their knowledge. This access opens up new opportunities for people and organizations around the world to gain the knowledge and skills they need to prepare for the future. User interface of Udemy is attached in Appendix A.2

1.3.4 Similar MOOC platforms

EdX

EdX was founded in 2012 by Harvard University and the Massachusetts Institute of Technology as a nonprofit organization. However, in 2021, edX was acquired by 2U for $800 million and ceased to be a nonprofit organization. edX is the second largest MOOC platform in the world with more than 42 million students and 7 million new students. edX offers around 3,550 courses and cooperates with more than 100 universities, and offers many types of certification programs.

Udacity

Udacity has abandoned its former identity as a MOOC platform. It has partnered with technology companies to create Nanodegrees, which prepare students for technology-based professions. A nanodegree costs about $1,000 and can take several months to complete. Udacity has stopped publishing free courses, but its catalog still contains a number of courses that can be accessed for free. In 2021, Udacity improved its offerings to businesses, tripling the number of scholarships while reducing the number of free courses.

Khan Academy

Khan Academy's organizational mission is based on the belief that education is a human right. To that end, it offers completely free online courses that include videos, exercises, and individual learning panels. Unlike many other MOOC providers, Khan Academy primarily focus on 12th grade students and offers courses in pre-algebra, English, chemistry, American government, and civics. In addition, Khan Academy provides resources for teachers and parents to implement standards-aligned materials and monitor student progress. Web-based tools allow users to communicate with students and teachers around the world.

Tools used in this study:

The tools used in the survey are Coursera, Udemy and Google forms.

Coursera and Udemy are MOOC platforms where the users are enrolled in a specified course and get acquainted with the platforms by completing their tasks.
Google forms are used for the survey questionnaire, recording the responses and generating graphs for the responses recorded for the questionnaire.

1.4 Scope of the thesis

The scope of this study covers selected MOOC platforms Coursera and Udemy. This study is limited to assessing the usability components: Effectiveness, Efficiency, Satisfaction level, and user experience of two MOOC platforms(Coursera and Udemy). The survey results are for free courses only and do not apply to fee-based courses, so the article results cannot be generalized. The survey evaluation is taken to get a better user experience with the platforms. A survey was conducted among a few respondents by relating the usability heuristics with the selected MOOC platforms, and the conclusion is based on the survey results.

1.5 Outline

This thesis mainly focuses on user satisfaction, effectiveness, efficiency, and usability heuristics compared with the selected MOOC platforms Coursera and Udemy. The first research question is regarding the user satisfaction level, efficiency, and effectiveness of the MOOC platforms. These are calculated by using the respondent's time of completion for the specific tasks given to them and the feedback of each task performed by the respondents. The second research question is based on a comparative analysis of user experience with the MOOC platforms through a survey questionnaire for the fifteen respondents. The survey results are concluded from the graphical representation.

Chapter 2

Related Work

This section gives an overview of the research papers which are relevant to our research study.

Nielsen [16] has listed ten general principles for user interface design, called usability heuristics. These include visualization of the system state, alignment of the system with the real world, user control and freedom, consistency and standards, error prevention, recognition rather than memorization, flexibility and usability, aesthetics and minimal design, helping users identify, diagnose, and correct errors, and help and documentation. This paper inspired to use of heuristic usability principles applied to the selected MOOC platform to measure the user experience.

Conache et al. [5] discuss the usefulness of MOOC platforms to revitalize teaching and learning and create new virtual spaces for educational exchange. The main points describing MOOC platforms are gathered. The factors analyzed have been divided into three categories: business model, course design, and popularity. A detailed comparison of the four platforms is also given based on the data collected from each platform. This research paper inspires the data collection idea.

Zhou [27] explains that massive open online courses (MOOCs) represent a new intellectual and technological approach and personalized teaching and learning philosophy. The prominence of MOOCs in the development of distance education signifies the arrival of a new era, that of open learning. The usability of MOOCs platforms was evaluated quantitatively. The study focused on the actual user experience rather than traditional technical issues and features. Methodologically, several improvements over previous studies were suggested. This study inspired to focus on user experience in MOOC platforms rather than the traditional educational systems.

Bevana et al. [4] argue that usability resides in the interaction between the user and the product or system and can only be accurately measured by assessing user performance, satisfaction, and acceptance. Usability can change as the product's characteristics, system, user, task, or environment change. A product is not usable or unusable by itself but has characteristics that determine its suitability for a particular user, task, or environment. This paper helped get an idea about the interactiveness between the system and the user interface.

Espada et al. [6] state that a common feature of these courses is the use of assessment tests to demonstrate course success and student knowledge acquisition. This analysis considers most of the characteristics and elements that influence the online user experience and highlights the characteristics that can significantly impact

MOOC platforms. This study inspired us to consider calculating respondents' skills or knowledge.

Pireva et al. [21] focus on a multi-point comparison of advanced LMSs. They also explore the behavior and experience of users of different LMSs and MOOCs for the first time by observing users' facial expressions. From this paper, a comparison of state of the art in multiple points and how to examine the behavior of the respondents while performing the tasks can also make a difference is known.

Shubina [23] explains how she determined and compared user satisfaction of major MOOC platforms. Usability testing methodology was applied to study user satisfaction of three major MOOC providers. During the study of this paper, the idea of the history of distance learning, the MOOC phenomenon, usability theory, and usability testing methods helped to understand the chosen topic better.

Oktavia et al. [19] discussed the definition of critical features of MOOCs based on the educational perspective of online learning activities and RASE (Resource Activity Support Evaluation) and how this platform can be used as a global opening. From the learner's perspective, these features included in edX and Coursera have similar functions and activities. The components of EBP pedagogy (resources, activities, support, and assessment) were compared with the operational activities performed. We have been inspired by the features and activities done using the MOOCs from the paper.

Gattupalli and Reddivari [7] describe methods for empathizing with usability heuristics. The usability heuristic compares free versions of canvas and google-classroom to measure user satisfaction. The study focuses on user satisfaction when using LMS platforms such as Canvas and google classroom and uses usability heuristics to measure user satisfaction. This paper inspired how to use the techniques to compare the usability heuristics and the measures.

Sukamolson [24] discusses the main basic concepts of quantitative research. He explains types of research, the definition of quantitative research, types of quantitative research and prerequisites for using or not using quantitative methods, benefits of quantitative research, standard methods and designs, and common misconceptions. Criteria for evaluating quantitative research programs are also provided. The main topics covered are the essential prerequisites for quantitative research and the misconceptions that many researchers encounter. This paper is the inspiration for taking the quantitative research method.

Johansson and Frolov [10] conducted a study to develop a list of recommendations and a usability checklist to help evaluate the usability of user interfaces for Massive Open Online Courses (MOOCs). Interviews had conducted to understand their use and identify design priorities for evaluating MOOC interfaces. Then, using Jacob Nielsen's heuristic method, the author's ten heuristics were used to examine the usability issues of these design focuses. The study came to two main conclusions. First, MOOCs are used differently from traditional university courses, with a different user experience and approach. Second, usability checklists need to be adaptable and updateable to respond to changes in the MOOC usage environment. Using Jacob Nielsen's heuristics to develop and checklist is taken from this paper.

Korableva et al. [11] studied the advantage of online courses over traditional education. Their research on why students fail in online courses has yielded mixed results, but one of the factors identified is interface design and the issue of interface impact on the user. This paper studies two different online MOOC platforms to identify factors that increase usability and develop a methodology for determining the optimal design solution. A comparative analysis of two MOOC platforms (Coursera and Open Education) was used to identify optimal behaviours and to understand which details of online platform design to pay attention to and which not to. This paper inspired a comparative study between the two MOOC platforms.

Shubina [23] compared user satisfaction levels of representative MOOC platforms. A quantitative research method was used in this paper. Usability testing methods were applied to investigate user satisfaction of three large-scale online course providers. Usability was assessed for each MOOC platform to answer the main research question. To carry out this work, the authors studied the history of the development of distance education, the phenomenon of MOOCs, usability theory, and usability testing methods and techniques to broaden their knowledge on the chosen topic. In this paper, the quantitative method is considered, and survey data of users' age, gender and level of education helped analyse the user's level of knowledge and skills.

Chapter 3

Method

This chapter represents the methodology used to conduct the experiments in this thesis. The outcome of this chapter is a comparative evaluation of the MOOC platforms - Coursera and Udemy - comparing them using usability heuristics and examining the effectiveness, efficiency, and satisfaction of the MOOC platforms. A comparative evaluation is a process of collecting data and analyzing the characteristics of different products or applications to make a decision and achieve a certain goal. Users were given specific tasks on the platforms and asked to answer a questionnaire based on their platform experience. The questionnaire was based on usability heuristics. The usability heuristic is described in more detail in Section 1.3.

3.1 Quantitative Research Method

Quantitative research method [24] involves the numerical representation and handling observations, and the phenomena reflected in the observations can be interpreted. Quantitative research is essentially the collection of numerical data to explain a phenomenon, and it seems immediately appropriate to answer a particular question using quantitative methods.

Quantitative research is of different types: survey research, experimental research, correlational research, and causal-comparative research. In this paper, survey research is used by forming a questionnaire design to measure which MOOC platform (Coursera and Udemy) gives a better experience for the user using the heuristic principles.

In this paper, similar tasks are allocated to fifteen users, and the timings of the tasks' performed by the users are noted. These observations from the users are the numerical data, which is used to calculate the effectiveness and efficiency of the MOOC platforms (Coursera and Udemy).

Survey research method

The survey research method is defined as the collection of information from a sample through the responses of individuals to questions. This type of research can use various methods, including participant recruitment, data collection, and a variety of tools. The survey research method can involve quantitative research strategies, such as questionnaires, and qualitative research strategies, such as open-ended questions or mixed methods at the same time.[22]

The main objective of this type of survey research method is to obtain information describing the characteristics of a sample of target individuals over a relatively short period. These surveys are usually conducted by mail or through a google form to obtain opinions that form the basis of a product for a group.

3.2 Scientific Methods

1. **The scientific method used for RQ1** :

   RQ1 will be scientifically answered by calculating the two MOOC platforms' effectiveness, efficiency, and satisfaction level from the survey data collected.

   Effectiveness :

   Effectiveness is measured using the completion rates and the number of errors. Completion is the percentage of the tasks which the users complete successfully. Effectiveness will be calculated by measuring the completion rate of the tasks given to the user.

   Efficiency :

   Efficiency helps calculate the user's time spent completing the tasks. Both efficiency and Effectiveness are directly related, as efficiency is the user effectiveness divided by the time spent by the user, and it is time-based efficiency. Efficiency will be calculated by measuring the time taken by the user to complete the specific tasks.

   Satisfaction Level :

   Task level satisfaction helps measure the users' impression when confronted with the system while working on it. Satisfaction level will be obtained by collecting the user feedback through a Likert scale rating[13].

   A Likert scale is used mainly in questionnaires to determine participants' level of preference or agreement with a statement or set of words. Likert scales are non-comparative assessment methods and are unidimensional (measuring only one characteristic). Respondents are asked to represent their level of agreement with the statement on a continuous scale.[2]

Likert Values	Very Difficult (1)	Difficult (2)	Somehow Difficult (3)	Neutral (4)	Somehow Easy (5)	Easy (6)	Very Easy (7)
Tasks	o	o	o	o	o	o	o

Table 3.1: Likert Scale Rating for each task

2. **The scientific method is used for RQ2** :

   RQ2 will be answered by using statistical measures such as variance and standard deviation.

3.3 Performing tasks in MOOC platforms:

This section explains the details of the tasks given to the respondents and how the experiments were conducted. Tasks descriptions were explained to the respondents, and eight tasks were given.
The respondents were given eight tasks to perform on both MOOC platforms and the timings of each completed task while performing the tasks are noted. In both MOOC platforms,similar tasks were given to the respondents. Each task given to the respondents on both platforms is explained in detail.
Task 1
The user's task is to open the browser and log in/signup for the MOOC platforms (Coursera, Udemy).
Task 2
The user's task is to open the search bar in the MOOC platforms and search for the specified course (Machine learning).
Task 3
The specified course in the MOOC platform is opened, and there the users need to check out the course content/info.
Task 4
The user's task is to enroll in the course and play the introduction video of the course.
Task 5
The user's task is to complete the quiz based on the introduction video and submit the quiz.
Task 6
The user's task is to update/upload the profile.
Task 7
The user's task is to check for the notifications on the MOOC platforms.
Task 8
The user's task is to share the course using social network which the MOOC platforms provide.

After tasks were completed, the respondent's completion time for the tasks was noted to calculate the effectiveness and efficiency. Furthermore, the respondents were given the Likert scale to measure the satisfaction level of each platform. The respondents will give the Likert scale values for each task performed on Coursera and Udemy. The results obtained from the respondents will be used to measure satisfaction levels.
The effectiveness, efficiency, and satisfaction level are calculated and mentioned in chapter 5.

3.4 Survey Evaluation

A survey is a research method defined by collecting data from a sample of respondents to obtain and record users' opinions. Our survey questionnaire consists of closed questions, Likert scale questions, and multiple-choice questions. The survey was conducted using Google Forms.

The questionnaire covered the tasks presented in section 4.1. The task questions corresponded to the usability heuristics presented in section 4.2. The data collected to calculate satisfaction level, effectiveness, and efficiency are tabulated in Chapter 5. The survey results were converted into statistical data. Most of the statistics consisted of pie charts and bar graphs. The respondent's details are kept confidential.

3.5 Profile of Respondents

This section provides details about the respondents who participated in the survey. The participant's details are anonymous. Fifteen participants were included in the survey; four were familiar with the course, and the remaining were familiar with both platforms. The respondents' gender, age, and education were asked. This information was used to determine the skill and knowledge level of the users. Of the respondents,60% were male and 40% were female. Participant's ages were in the range 18-25 years. The respondents have a Bachelor's or a Master's degree. The level of education of one respondent is a Master's degree, and the remaining were Bachelor's degree respondents.

	Number of responses (N=15)	**Percentage (100%)**
Gender		
Male	9	60
Female	6	40
Age		
18-21	9	60
22-25	6	40
Level of Education		
Bachelor's degree	14	93
Master's degree	1	7

Table 3.2: Participants profile

Chapter 4

Data Collection

Data collection is the systematic process of collecting observations or measurements. A survey method is used in the thesis to collect data, and all questions asked to the respondents in the survey are mentioned in this section.

4.1 Survey Questionnaire

This section contains screenshots of the questions in our survey. The survey questions are a combination of Likert scale questions and closed-ended questions.

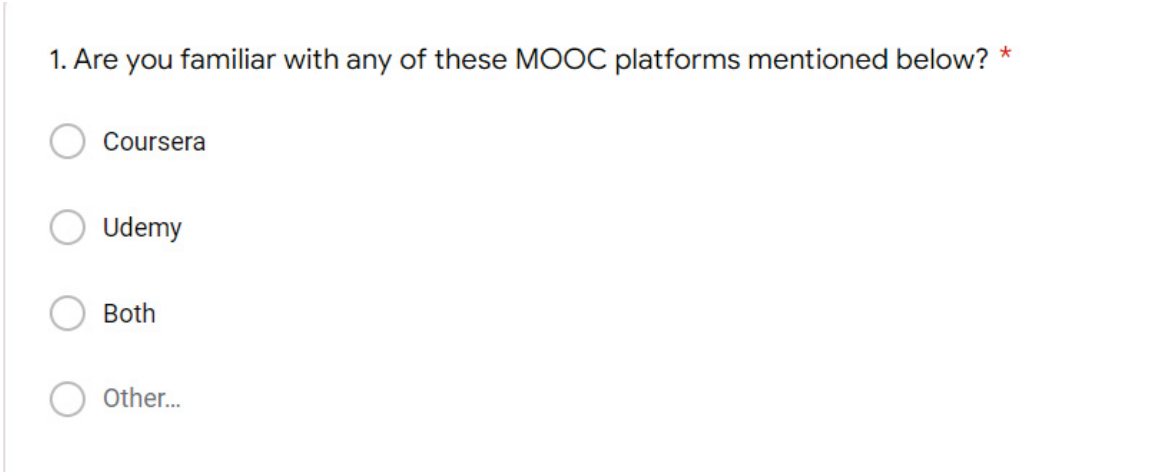

Figure 4.1: Survey Question 1

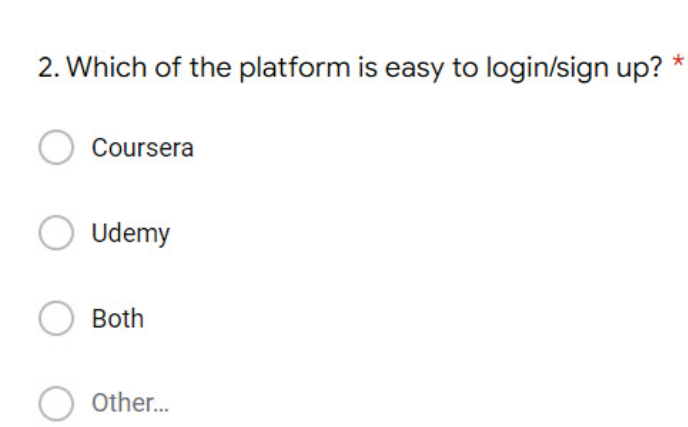

Figure 4.2: Survey Question 2

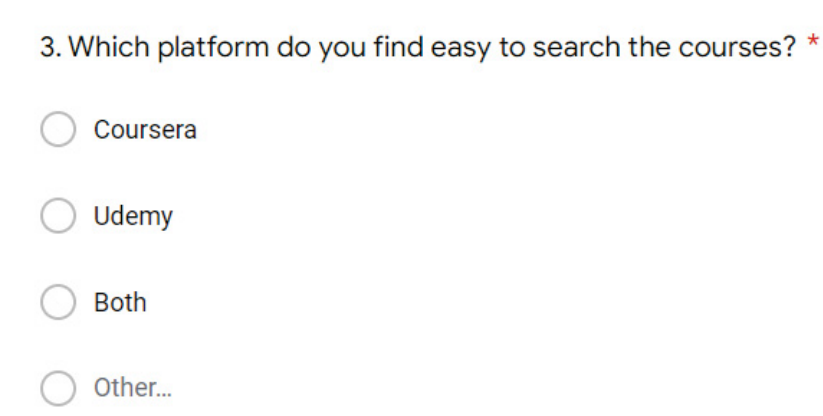

Figure 4.3: Survey Question 3

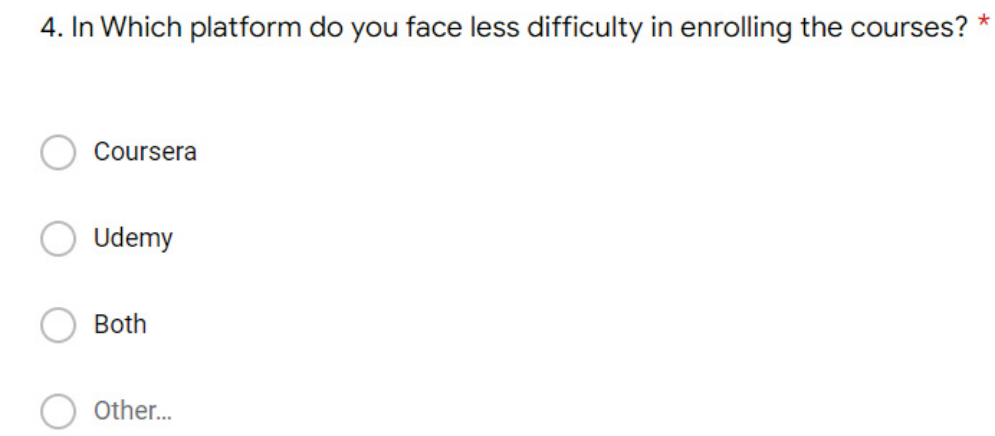

Figure 4.4: Survey Question 4

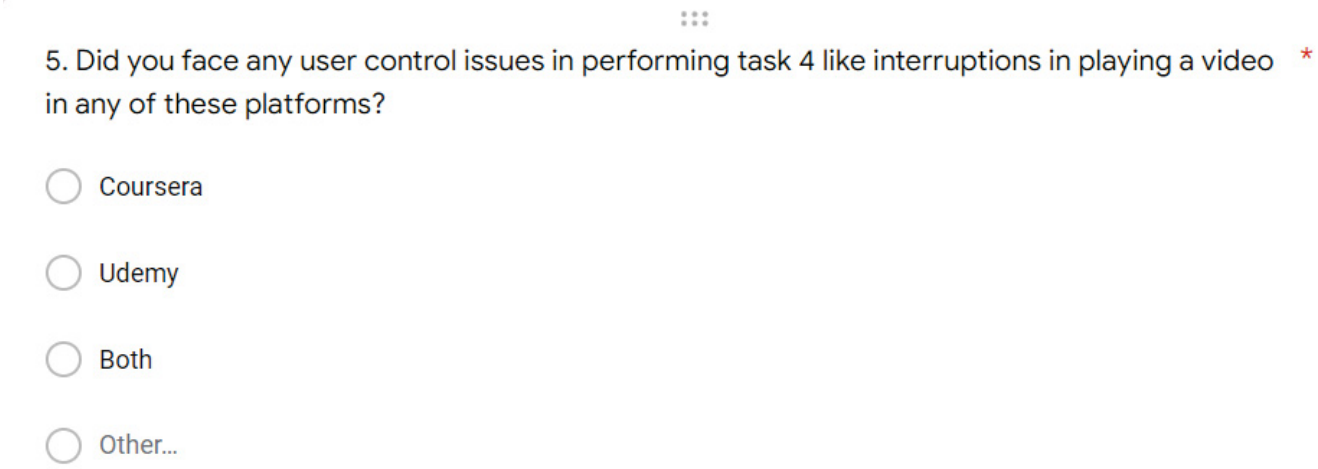
5. Did you face any user control issues in performing task 4 like interruptions in playing a video in any of these platforms? *
Coursera
Udemy
Both
Other...

Figure 4.5: Survey Question 5

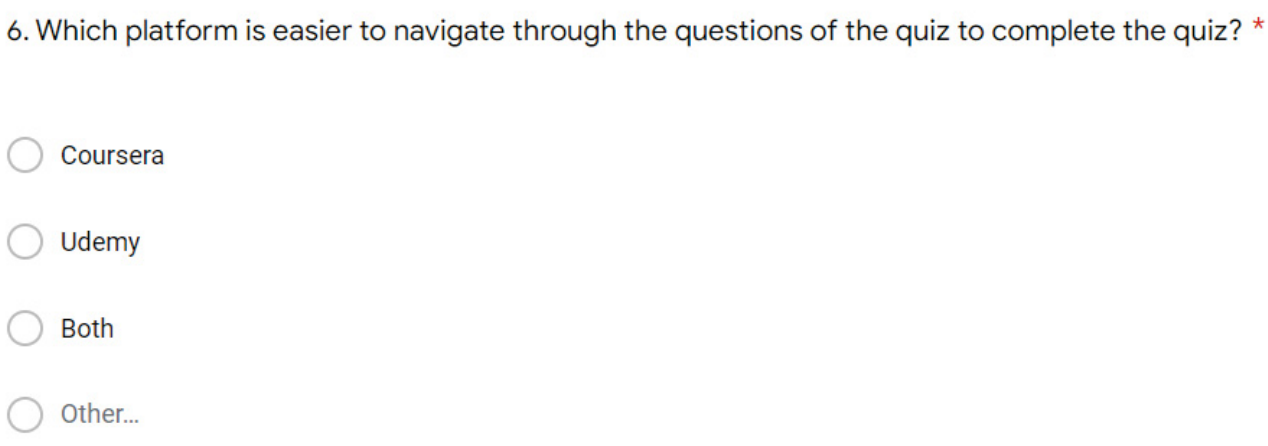

Figure 4.6: Survey Question 6

7. While uploading or updating the profile picture of the MOOC platforms which one is faster and efficient? *

- Coursera
- Udemy
- Both
- Other...

Figure 4.7: Survey Question 7

8. In which MOOC platform it is easier to find the notification icon or label similar to other social media (like Facebook, LinkedIn)? *

- Coursera
- Udemy
- Both
- Other...

Figure 4.8: Survey Question 8

9. Which platform gave a better share experience while sharing the course to others? *

- Coursera
- Udemy
- Both
- Other...

Figure 4.9: Survey Question 9

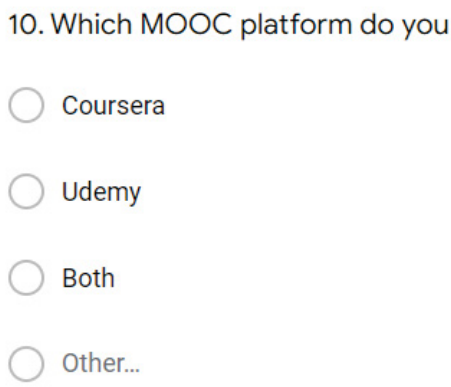

Figure 4.10: Survey Question 10

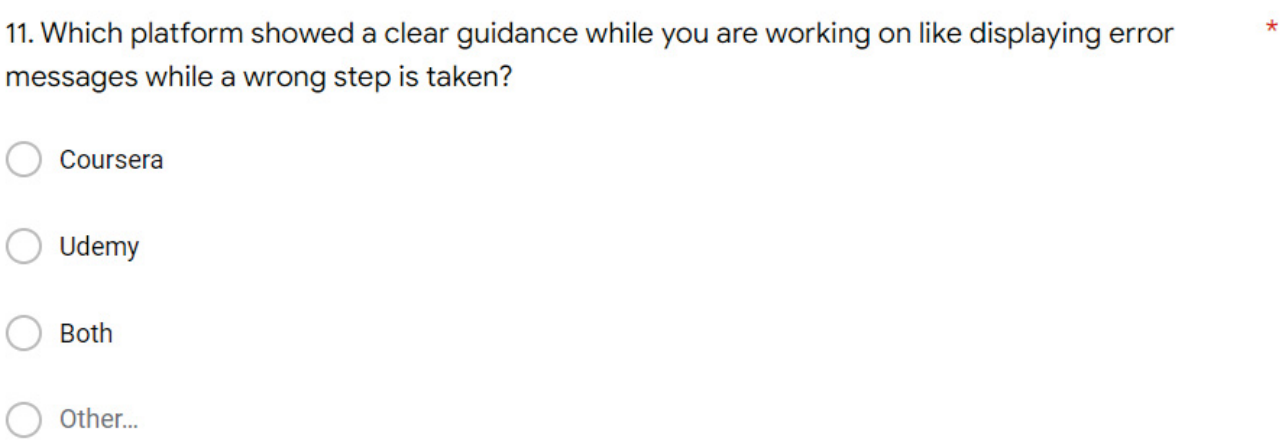
11. Which platform showed a clear guidance while you are working on like displaying error messages while a wrong step is taken? *
Coursera
Udemy
Both
Other...

Figure 4.11: Survey Question 11

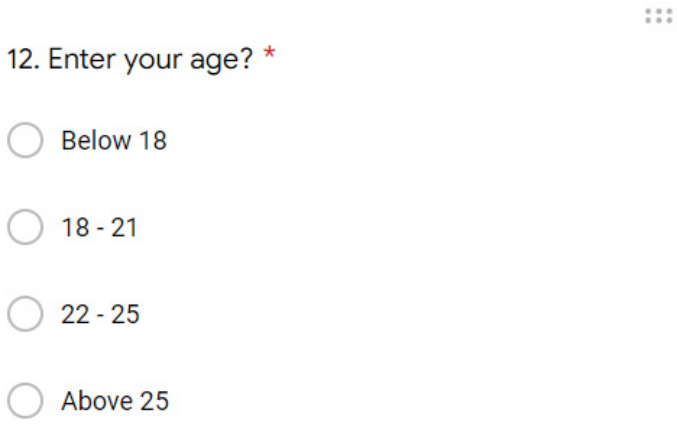

Figure 4.12: Survey Question 12

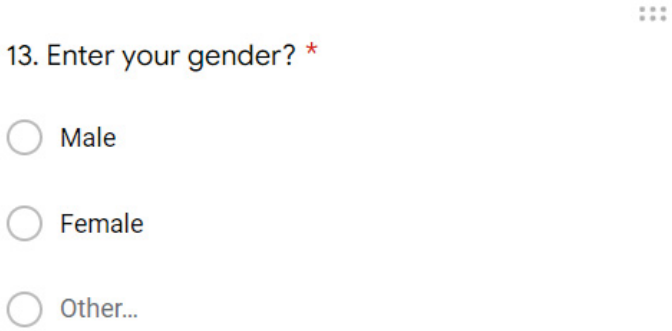

Figure 4.13: Survey Question 13

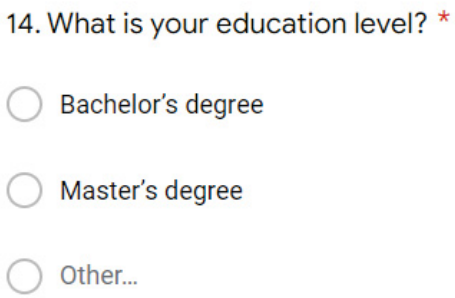

Figure 4.14: Survey Question 14

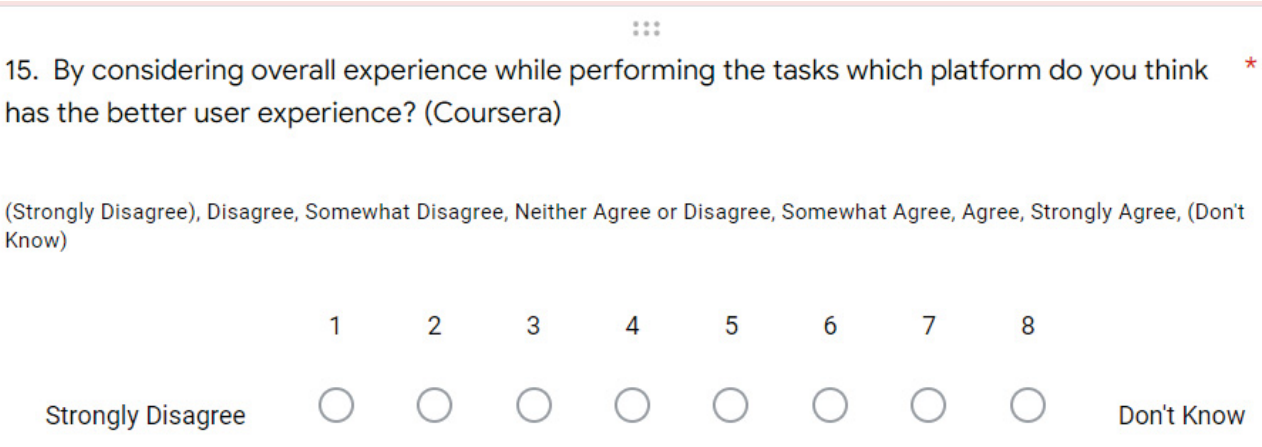
15. By considering overall experience while performing the tasks which platform do you think has the better user experience? (Coursera) *
(Strongly Disagree), Disagree, Somewhat Disagree, Neither Agree or Disagree, Somewhat Agree, Agree, Strongly Agree, (Don't Know)
1 2 3 4 5 6 7 8
Strongly Disagree
Don't Know

Figure 4.15: Survey Question 15

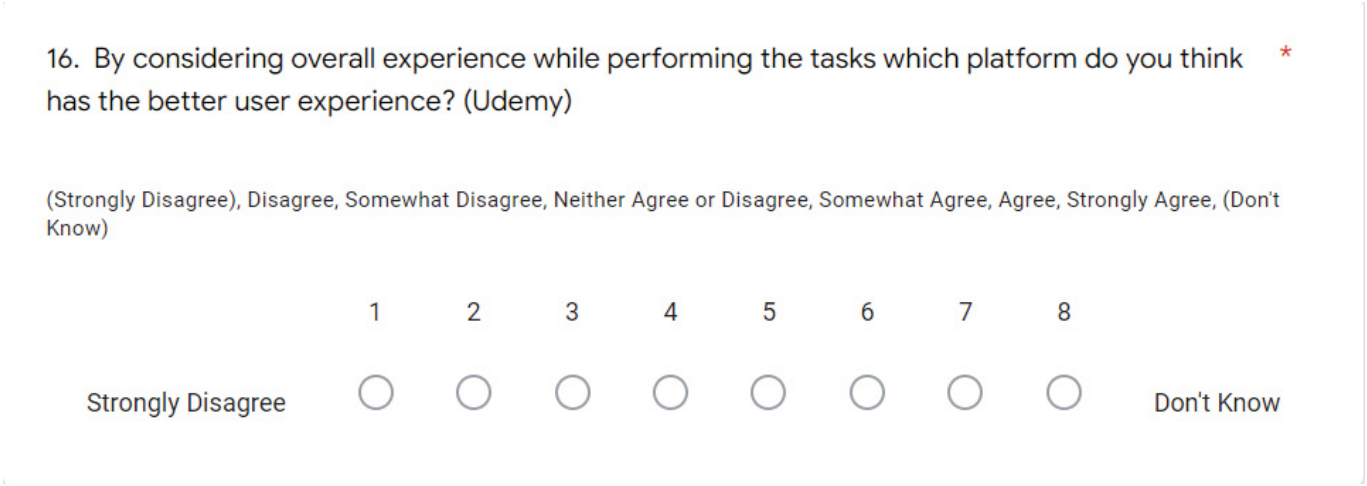
16. By considering overall experience while performing the tasks which platform do you think has the better user experience? (Udemy) *
(Strongly Disagree), Disagree, Somewhat Disagree, Neither Agree or Disagree, Somewhat Agree, Agree, Strongly Agree, (Don't Know)
1
2
3
4
5
6
7
8
Strongly Disagree
Don't Know

Figure 4.16: Survey Question 16

4.2 Mapping

Survey Questionnaire	Usability Heuristics
1. Are you familiar with any of these MOOC platforms mentioned below?	To know the user's familiarity with MOOC platforms
2. Which platform is easy to login/sign up for?	a. Visibility of system status b. Aesthetic and minimalist design
3. Which platform do you find easy to search for the courses?	c. Consistency and standards d. Recognition rather than recall
4. In which platform do you face less difficulty in enrolling the courses?	e. Match between the system and the real world
5. Did you face any user control issues in performing task 4, like interruptions in playing a video on any of these platforms?	f. User control and freedom
6. Which platform is easier to navigate through the quiz questions to complete the quiz?	a. Visibility of system status g. Error prevention
7. While uploading or updating the profile picture of the MOOC platforms, which one is faster and more efficient?	a. Visibility of system status
8. In which MOOC platform is it easier to find the notification icon or label similar to other social media (like Facebook, LinkedIn)?	e. Match between the system and the real world
9. Which platform gave a better share experience while sharing the course with others?	h. Flexibility and efficiency of use
10. Which MOOC platform do you think has a better help and documentation section?	i. Help and document
11. Which platform showed clear guidance while you are working on, like displaying error messages while a wrong step is taken?	j. Help users recognize, diagnose and recover from errors
12. Enter your age? 13. Enter your gender? 14. What is your education level?	To understand the degree of user skills and knowledge
15. By considering the overall experience while performing the tasks, which platform do you think has the better user experience? (Coursera)	Overall user experience with the platform
16. By considering overall experience while performing the tasks which platform do you think has the better user experience? (Udemy)	Overall user experience with the platform

Table 4.1: Mapping usability heuristics to survey questions

Chapter 5

Results and Analysis

This chapter contains the results of the survey conducted on fifteen users. Four of them were familiar with Coursera, and the remaining were familiar with both platforms. The threshold is determined by the average number of times performance is measured. To calculate effectiveness and efficiency, the time it takes each user to complete a task is measured. The threshold value is the average value of each task performed by every user. The values which are higher than the threshold value are not included in the usability index calculation. For measuring usability, effectiveness and efficiency are measured, and satisfaction is measured using task-level (SEQ).

5.1 Task timings for both MOOC platforms

Coursera
The below table 5.1 shows each task completed by individual users of the Coursera platform.

Users	**Task1**	**Task2**	**Task3**	**Task4**	**Task5**	**Task6**	**Task7**	**Task8**
1	15	38	108	16	257	147	33	76
2	18	19	187	10	264	107	34	12
3	14	39	242	15	317	171	31	121
4	60	20	187	12	344	84	32	10
5	15	38	108	18	257	147	33	76
6	81	21	247	13	256	81	31	20
7	62	20	243	16	345	74	31	11
8	80	20	188	20	286	72	21	10
9	62	20	248	10	345	74	31	11
10	85	21	242	13	236	71	12	10
11	54	20	135	14	341	81	30	10
12	116	14	243	15	301	65	31	10
13	92	21	244	16	276	65	34	10
14	102	12	222	10	291	62	21	10
15	112	10	221	12	302	71	12	12
Threshold Value	64.53	22.2	204.33	14	294.53	91.46	27.8	27.26

Table 5.1: Task Timings (in sec) of Coursera

Effectiveness :

Effectiveness will be calculated by measuring the completion rate of the tasks given

to the user.

$$\begin{aligned}\text{Effectiveness} = \frac{\text{Number of tasks completed successfully}}{\text{Total Number of tasks undertaken}} \times 100 \\ = 69/120 * 100 \\ \text{Effectiveness} = 57.5\%\end{aligned} \tag{5.1}$$

Number of tasks completed successfully mean the tasks completed within the threshold time.

Efficiency :

Efficiency will be calculated by measuring the time taken by the user to complete the specific tasks.

$$\text{Efficiency} = \frac{\sum_{j=1}^{R}\sum_{i=1}^{N}\frac{n_{ij}}{t_{ij}}}{NR} \tag{5.2}$$

$$\text{Efficiency of Coursera} = 0.027\text{goals/sec.} \tag{5.3}$$

Udemy
The below table 5.2 shows each task completed by individual users of the Udemy platform.

Users	**Task1**	**Task2**	**Task3**	**Task4**	**Task5**	**Task6**	**Task7**	**Task8**
1	67	41	141	19	166	159	12	88
2	63	40	180	15	181	62	57	28
3	10	41	145	22	166	209	10	80
4	64	30	242	19	340	61	45	25
5	57	41	141	19	166	159	12	88
6	73	34	226	18	351	121	24	23
7	56	29	302	20	289	61	25	24
8	59	59	226	22	351	59	25	20
9	56	29	302	21	289	61	25	24
10	54	30	184	18	161	94	15	15
11	71	23	141	19	242	144	20	9
12	102	21	186	19	292	64	24	13
13	102	17	272	10	222	116	25	12
14	100	15	194	15	221	65	15	12
15	65	13	201	14	271	59	16	15
Threshold value	66.6	30.86667	205.5333	18	247.2	99.6	23.33333	31.73333

Table 5.2: Task Timings (in sec) of Udemy

Effectiveness: Effectiveness will be calculated by measuring the completion rate

of the tasks given to the user.

$$\begin{aligned} \text{Effectiveness} = \frac{\text{Number of tasks completed successfully}}{\text{Total Number of tasks undertaken}} \times 100 \\ = 70/120 * 100 \\ \text{Effectiveness} = 58.3\% \end{aligned} \tag{5.4}$$

Efficiency :
Efficiency will be calculated by measuring the time taken by the user to complete the specific tasks.

$$\text{Efficiency} = \frac{\sum_{j=1}^{R}\sum_{i=1}^{N}\frac{n_{ij}}{t_{ij}}}{NR} \tag{5.5}$$

$$\text{Efficiency of Udemy} = 0.020\text{goals/sec.} \tag{5.6}$$

From the above calculations, the total successful tasks of Coursera is 69 and for Udemy is 70. The difference between Coursera and Udemy's effectiveness and efficiency is negligible from the analysis.

Satisfaction through SEQ(Single Ease Questionnaire):

The SEQ (Single Ease Questionnaire) is another type of satisfaction questionnaire, but this one is specific to the user's task and not to the system as a whole SEQ has a single question, "How easy is this task?" The SEQ is given to the participant, who expresses his or her opinion about the task. This question is based on a seven-point Likert scale (1-7). Although many other questionnaires are designed at the task or system level, this questionnaire is easy to use and has proven to be very effective.

Task-level satisfaction is measured by calculating the values of these scales. The following scale represents the scores (1-7) for Very Difficult, Difficult, Fairly Difficult, Neutral, Fairly Easy, Easy and Very Easy.

Likert Values	Very Difficult (1)	Difficult (2)	Somehow Difficult (3)	Neutral (4)	Somehow Easy (5)	Easy (6)	Very Easy (7)
Task1	o	o	o	o	o	o	o
Task2	o	o	o	o	o	o	o
Task3	o	o	o	o	o	o	o
Task4	o	o	o	o	o	o	o
Task5	o	o	o	o	o	o	o
Task6	o	o	o	o	o	o	o
Task7	o	o	o	o	o	o	o
Task8	o	o	o	o	o	o	o

Table 5.3: Likert Scale Rating

The above table 5.3 is given to the user for rating each task after all the tasks are completed.According to Coursera and Udemy's Likert scale, participants' responses to each task are listed below.

5.1.1 Coursera Platform Likert Scale Rating

Users	Task1	Task2	Task3	Task4	Task5	Task6	Task7	Task8
1	7	6	5	5	3	6	7	6
2	6	7	5	5	4	7	6	6
3	7	6	4	3	4	5	6	7
4	6	6	6	4	5	5	7	6
5	6	6	5	4	5	6	6	6
6	6	7	5	5	4	6	6	7
7	7	7	4	5	4	6	6	6
8	6	6	5	5	4	6	7	7
9	7	6	5	5	4	5	6	6
10	7	6	6	4	5	5	6	6
11	7	6	6	4	4	5	6	7
12	7	6	6	5	4	5	6	7
13	6	7	5	4	5	6	7	7
14	6	7	5	5	4	5	6	7
15	7	6	5	4	5	6	6	7

Table 5.4: Coursera Likert Scale Rating

Calculation Method
Users are multiplied by the number of cells in the scale and divided by the total number of users. This method is applied to each task. The average ratio is then calculated for each task. Finally, all responses for each task are added together and divided by the total number of users.
Calculations for Coursera Platform

Task 1:

$$\begin{aligned} & 8 * 7 + 7 * 6 \\ & = 98/15 \\ & = 6.53(Easy) \end{aligned} \tag{5.7}$$

Task 2:

$$\begin{aligned} & 5 * 7 + 10 * 6 \\ & = 95/15 \\ & = 6.33(Easy) \end{aligned} \tag{5.8}$$

Task 3:

$$\begin{gathered} 4*6+9*5+2*4 \\ =77/15 \\ =5.13(FairlyEasy) \end{gathered} \tag{5.9}$$

Task 4:

$$\begin{gathered} 8*5+6*4+*3 \\ =67/15 \\ =4.46(Neutral) \end{gathered} \tag{5.10}$$

Task 5:

$$\begin{gathered} 5*5+9*4+1*3 \\ =64/15 \\ =4.26(Neutral) \end{gathered} \tag{5.11}$$

Task 6:

$$\begin{gathered} 1*7+7*6+7*5 \\ =84/15 \\ =5.6(FairlyEasy) \end{gathered} \tag{5.12}$$

Task 7:

$$\begin{gathered} 4*7+11*6 \\ =94/15 \\ =6.26(Easy) \end{gathered} \tag{5.13}$$

Task 8:

$$\begin{gathered} 4*7+11*6 \\ =98/15 \\ =6.53(Easy) \end{gathered} \tag{5.14}$$

Total:

$$\begin{gathered} 6.3+6.33+5.13+4.46+4.26+5.6+6.26+6.533 \\ =5.63(FairlyEasy) \end{gathered} \tag{5.15}$$

5.1.2 Udemy Platform Likert Scale Rating

Users	Task1	Task2	Task3	Task4	Task5	Task6	Task7	Task8
1	6	6	5	5	3	6	7	6
2	6	6	5	4	4	6	6	6
3	7	6	4	3	3	5	6	7
4	6	6	6	4	4	5	7	6
5	6	6	5	4	5	6	6	6
6	6	7	5	4	4	6	6	7
7	7	7	4	5	4	6	6	6
8	6	6	5	5	4	6	6	7
9	7	6	5	5	4	5	6	6
10	7	6	6	4	5	5	6	6
11	7	6	6	4	4	5	6	7
12	7	6	5	5	4	5	6	6
13	6	7	5	4	5	6	7	6
14	6	7	5	5	4	5	6	7
15	7	6	5	4	5	6	6	6

Table 5.5: Udemy Likert Scale Rating

Calculations for Udemy Platform

Task 1:

$$\begin{aligned} & 8 * 6 + 7 * 7 \\ & = 97/15 \\ & = 6.46(Easy) \end{aligned} \tag{5.16}$$

Task 2:

$$\begin{aligned} & 11 * 6 + 4 * 7 \\ & = 94/15 \\ & = 6.26(Easy) \end{aligned} \tag{5.17}$$

Task 3:

$$\begin{aligned} & 2 * 4 + 10 * 5 + 3 * 6 \\ & = 96/15 \\ & = 5.06(FairlyEasy) \end{aligned} \tag{5.18}$$

Task 4:

$$\begin{aligned} & 1 * 3 + 8 * 4 + 6 * 5 \\ & = 92/15 \\ & = 6.13(Easy) \end{aligned} \tag{5.19}$$

Task 5:

$$\begin{aligned} & 2 * 3 + 9 * 4 + 4 * 5 \\ & = 62/15 \\ & = 4.13(Neutral) \end{aligned} \tag{5.20}$$

Task 6:

$$\begin{aligned} & 8 * 6 + 7 * 5 \\ & = 83/15 \\ & = 5.53(FairlyEasy) \end{aligned} \tag{5.21}$$

Task 7:

$$\begin{aligned} & 12 * 6 + 3 * 7 \\ & = 93/15 \\ & = 6.20(Easy) \end{aligned} \tag{5.22}$$

Task 8:

$$\begin{aligned} & 10 * 6 + 5 * 7 \\ & = 75/15 \\ & = 5(FairlyEasy) \end{aligned} \tag{5.23}$$

Total

$$\begin{aligned} Total & = 6.46 + 6.26 + 5.06 + 6.13 + 4.13 + 5.53 + 6.2 + 5 \\ & = 5.61(FairlyEasy) \end{aligned} \tag{5.24}$$

The above calculations of Coursera and Udemy are Fairly Easy for overall tasks, where Coursera and Udemy got 6.63 and 6.61 values, respectively.

The answers to the questionnaire are displayed in the form of graphs.

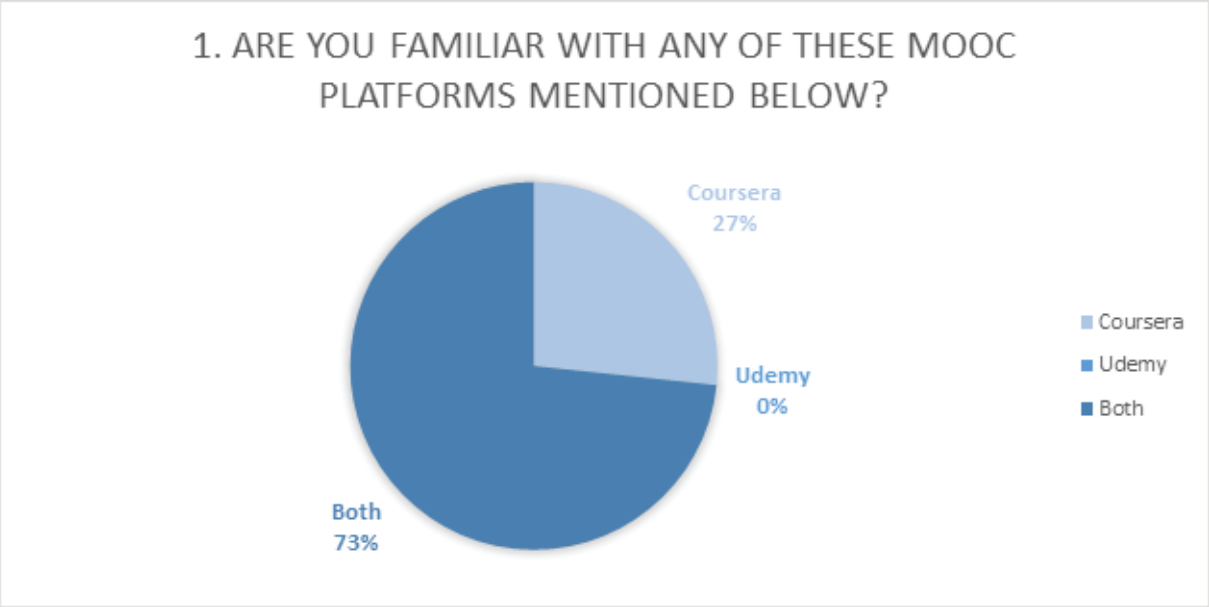

Figure 5.1: Responses for survey question-1

From the figure 5.1, most of the respondents have used both Coursera and Udemy. 27% were familiar with Coursera, and 73% were familiar with both platforms.

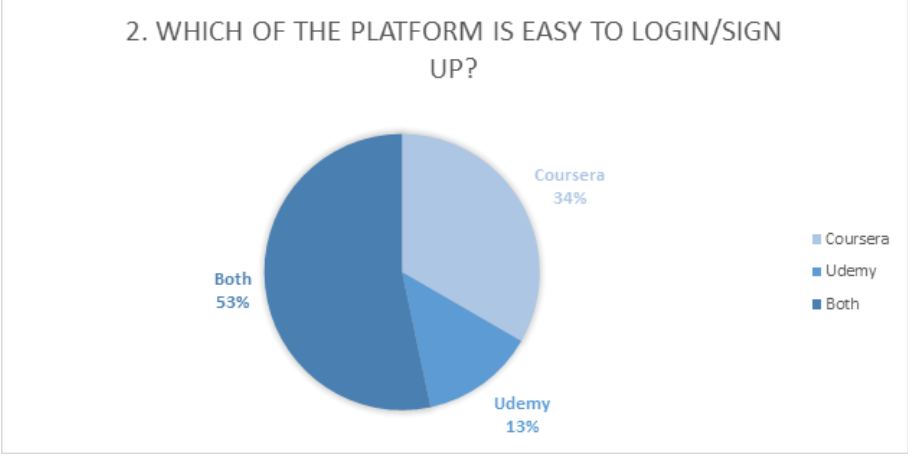

Figure 5.2: Responses for survey question-2

From the figure 5.2, 34% of the respondents found Coursera easy to log in, and 13% of the respondents found Udemy easy to log in. At the same time, 53% of the respondents found both platforms for easy login and signup.

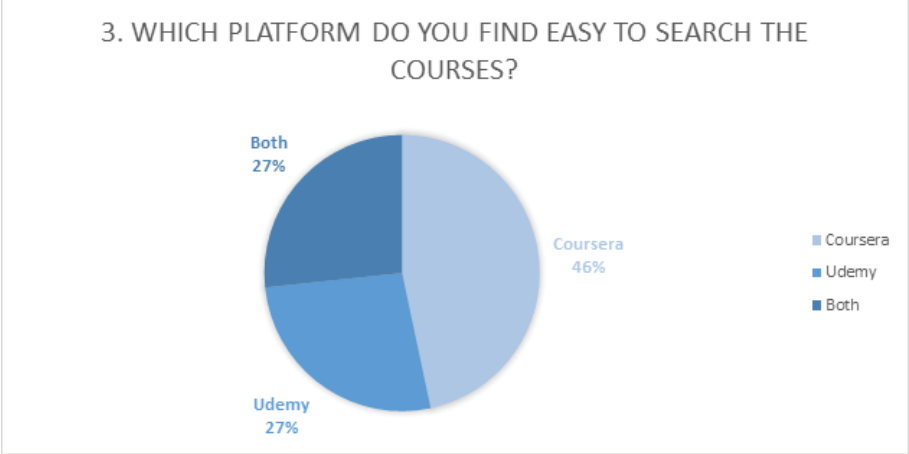

Figure 5.3: Responses for survey question-3

From the figure 5.3, 46% of respondents found Coursera easy to search the courses on the platform. In contrast, only 27% respondents found Udemy easy to search the courses, and 27% respondents found both platforms were easy to search the courses.

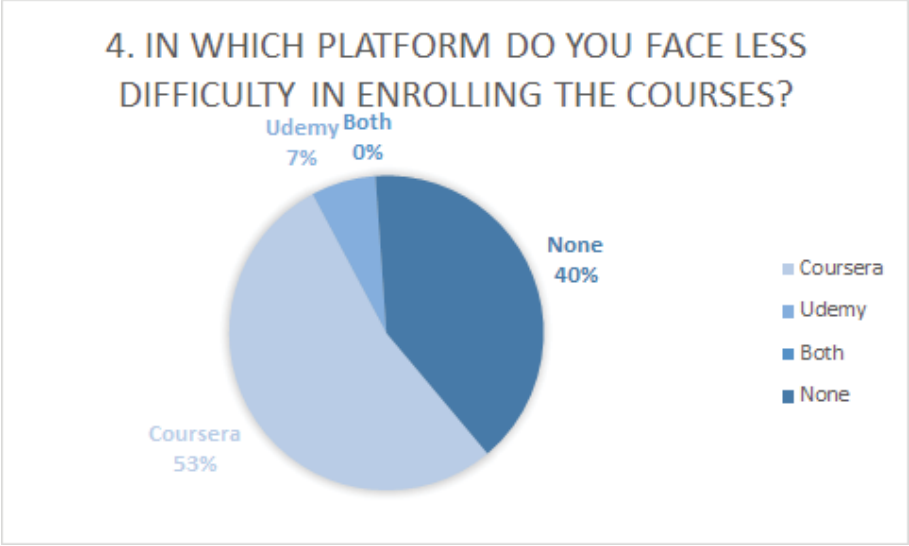

Figure 5.4: Responses for survey question-4

From the figure 5.4, 53% of the respondents found Coursera is better in enrolling the courses and 7%of the respondents found Udemy is better, whereas 40% respondents found both platforms have no difficulty enrolling the courses.

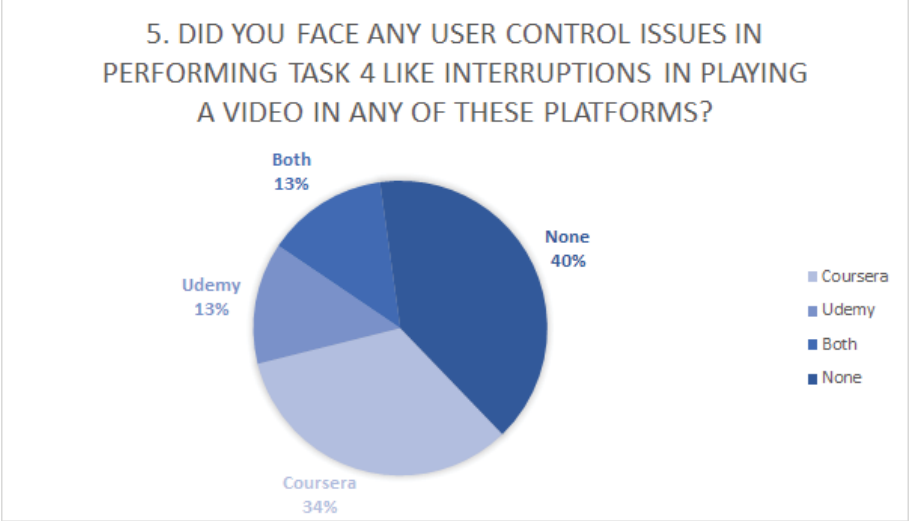

Figure 5.5: Responses for survey question-5

From the figure 5.5, 40% of respondents did not find any issues while playing the course videos. 34% of respondents found user control issues in Coursera and 13% in Udemy, whereas 13% in both the platforms.

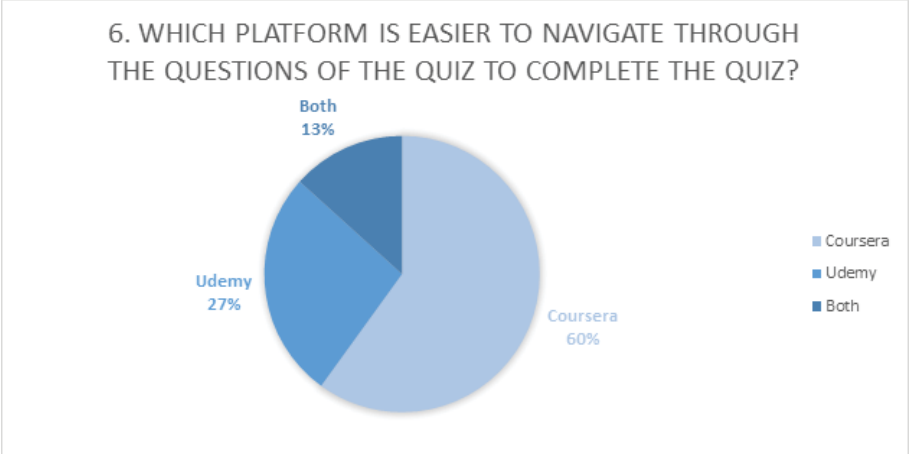

Figure 5.6: Responses for survey question-6

From the figure 5.6, 60% of the respondents found Coursera is easier to navigate through the quiz and 27% of them found Udemy is easy, and 13% of the respondents found both platforms were better in navigating the quiz.

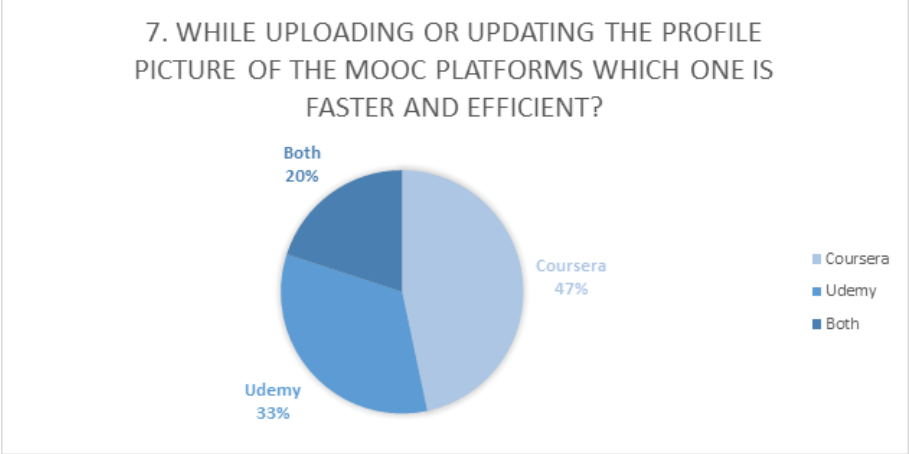

Figure 5.7: Responses for survey question-7

From the figure 5.7, 47% of the respondents found that Coursera is faster and more efficient in updating or uploading the profile. Furthermore, for Udemy, it is 33 %, whereas 20% of the respondents found both are faster in updating the profile.

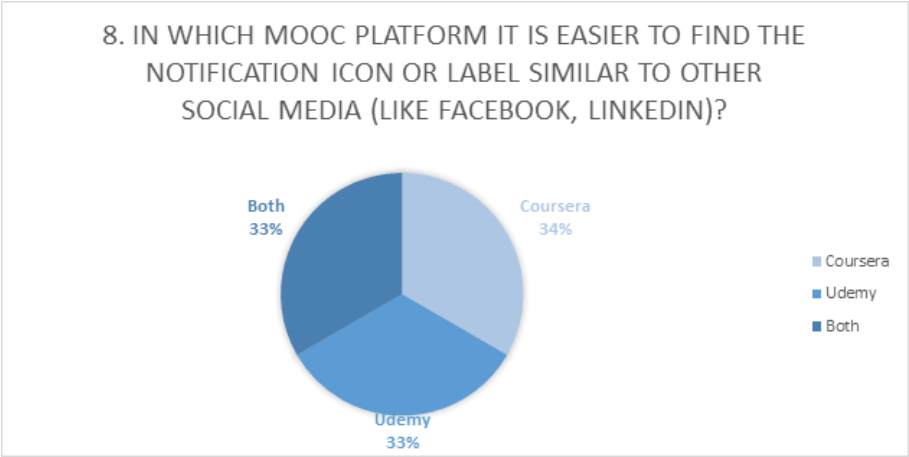
8. IN WHICH MOOC PLATFORM IT IS EASIER TO FIND THE NOTIFICATION ICON OR LABEL SIMILAR TO OTHER SOCIAL MEDIA (LIKE FACEBOOK, LINKEDIN)?
Both 33%
Coursera 34%
Udemy 33%
Coursera
Udemy
Both

Figure 5.8: Responses for survey question-8

From the figure 5.8, 34% respondents agreed that Coursera notifications are similar to other social media, and 33% of respondents agreed with the Udemy. The remaining 33% found both the platforms were similar to other social media platforms.

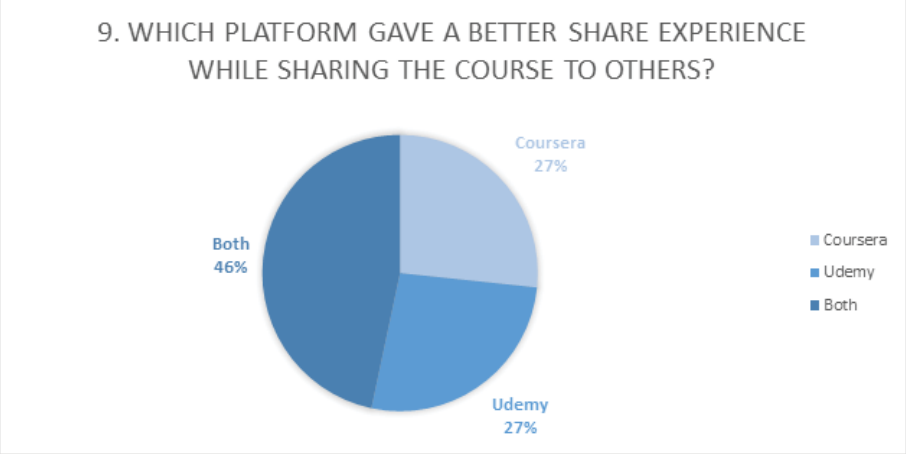

Figure 5.9: Responses for survey question-9

46% of the participants found both platforms have better share experience from the figure 5.9. And Coursera and Udemy both platforms got 27% respondent percentage for the good share experience.

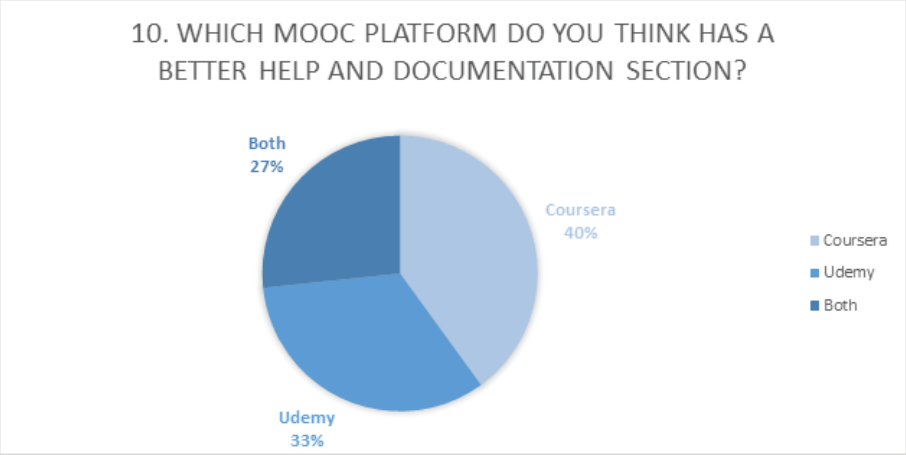

Figure 5.10: Responses for survey question-10

From the figure 5.10, 40% of respondents were able to think Coursera has a better help and documentation section, whereas 33% of people found Udemy. Furthermore, 27% thought both platforms had good help and documentation sections.

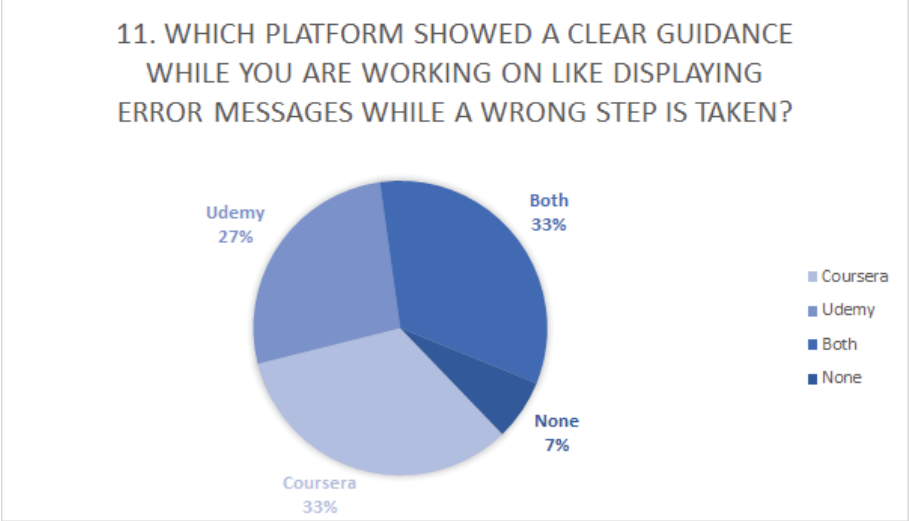

Figure 5.11: Responses for survey question-11

33% of the participants found Coursera showed better error-prevention methods from the figure 5.11. Moreover, 27% of the respondents found it in Udemy, and 27% of the participants found both have error prevention methods. Whereas 7% respondents found both platforms do not have any error preventing messages while a wrong step is taken.

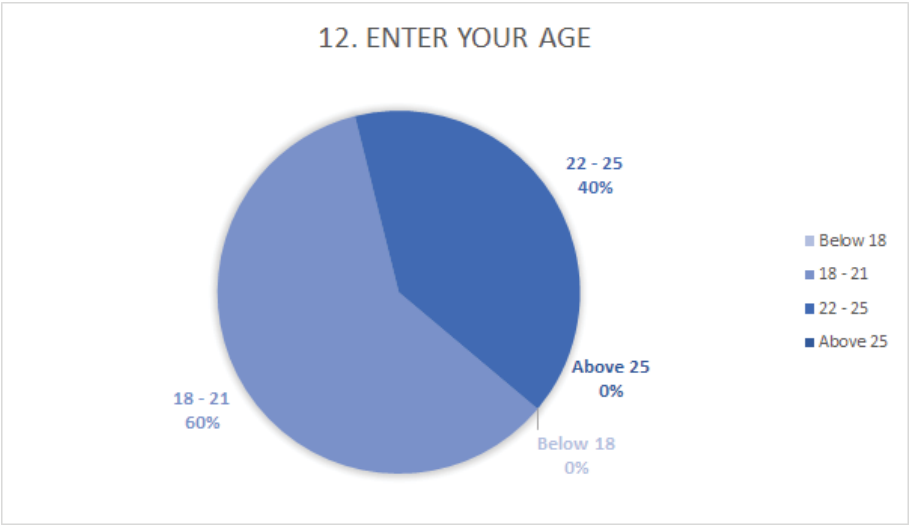

Figure 5.12: Responses for survey question-12

From the figure 5.12, 60% of the people who participated in this survey are aged 18-21 and 40% of them are 22-25.

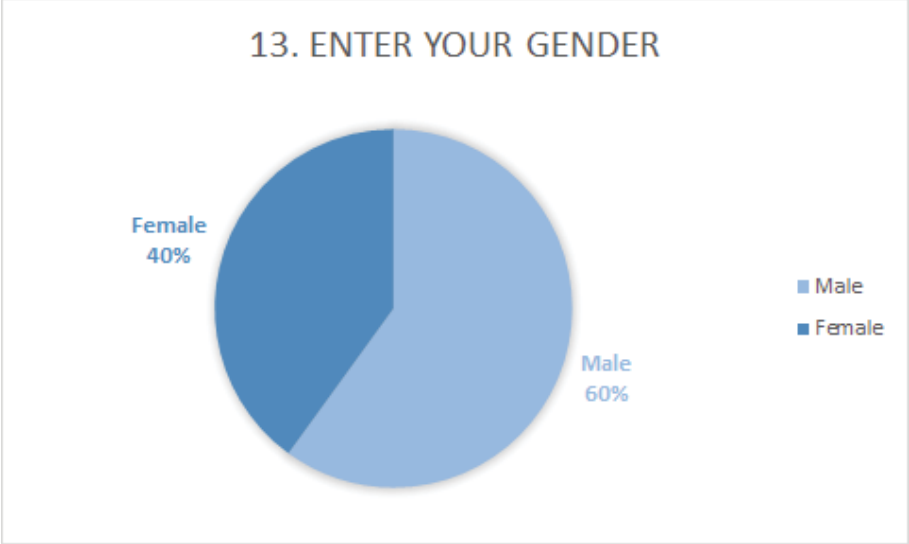

Figure 5.13: Responses for survey question-13

From the figure 5.13, 40% of the respondents were female, and 60% of them were male.

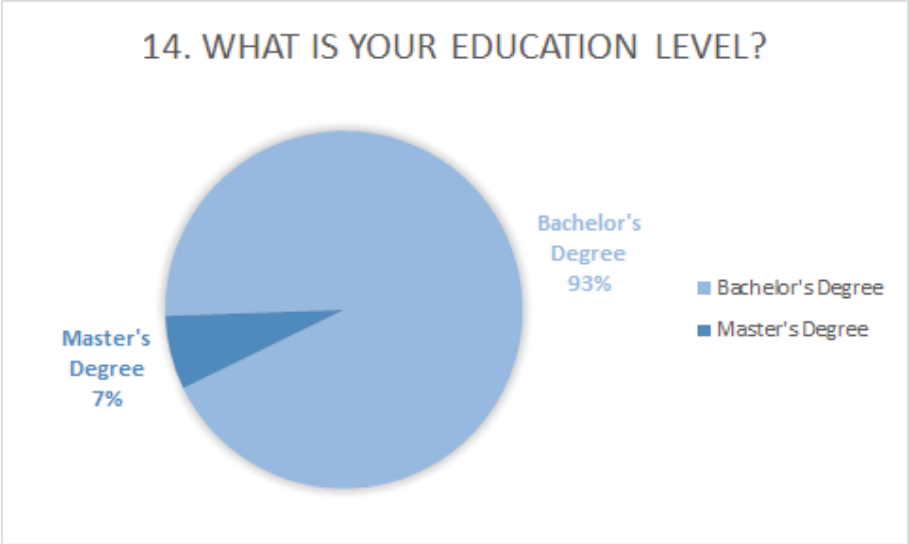

Figure 5.14: Responses for survey question-14

From the figure 5.14, 93% of the respondents who participated in the survey are Bachelor degree level, and 7% are Mater degree level respondents.

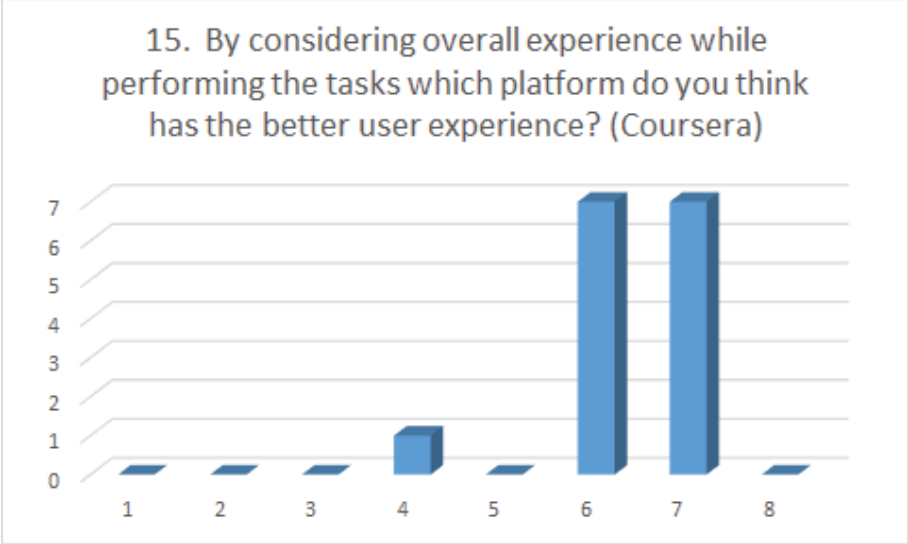

Figure 5.15: Responses for survey question-15

From figure 5.15, Users were asked to rate their level of satisfaction when using Coursers on a scale of 1 to 8. Where (Strongly Disagree, Disagree, Somewhat Disagree, Neither Agree or Disagree, Somewhat Agree, Agree, Strongly Agree, Don't Know: 1-8 respectively.)

Likert Scale	1	2	3	4	5	6	7	8
Values	0	0	0	1	0	7	7	0

Table 5.6: Likert scale of survey question-15

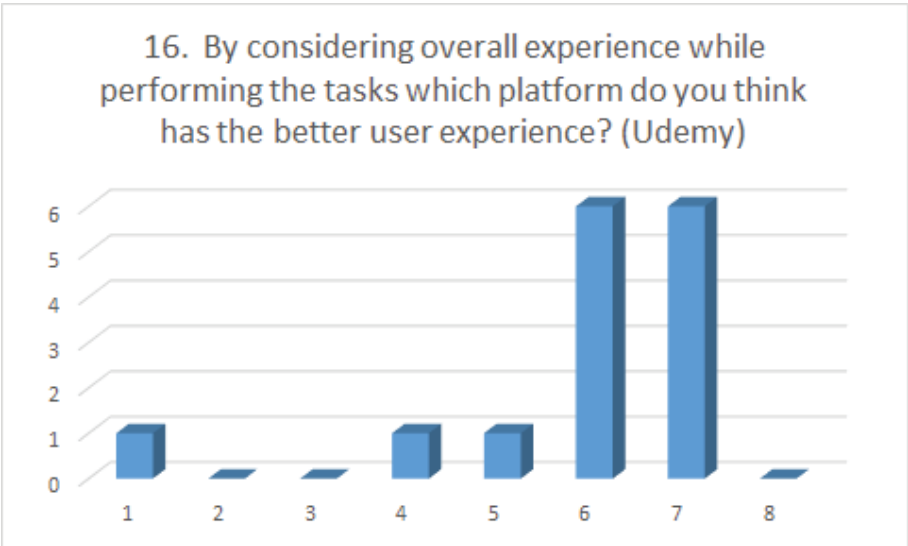

Figure 5.16: Responses for survey question-16

From figure 5.16, Users were asked to rate their level of satisfaction when using Udemy on a scale of 1 to 8. Where (Strongly Disagree, Disagree, Somewhat Disagree,

Neither Agree or Disagree, Somewhat Agree, Agree, Strongly Agree, Don't Know: 1-8 respectively.)

Likert Scale	1	2	3	4	5	6	7	8
Values	1	0	0	1	1	6	6	0

Table 5.7: Table : Likert scale of survey question-16

Variance :

$$Variance = \sigma^2 = \sum_{i}^{N} (m_i - \mu)^2 / N$$

Standard Deviation :

$$StandardDeviation = \sigma = \sqrt{\sum_{i}^{N} (m_i - \mu)^2 / N}$$

MOOC platforms	Mean(μ)	Variance(σ^2)	Standard deviation(σ)
Coursera	6.33	0.62	0.78
Udemy	5.86	2.38	1.54

Table 5.8: Table : Variance and Standard deviation of MOOC platforms

From the table 5.8, Udemy has a high variance and standard deviation compared to Coursera. Based on the calculation of the user ratings, Udemy provides a better user experience than Coursera.

Chapter 6

Discussion

In this section, the research questions are explained in detail. The first and second questions are well explained using the tasks and survey conducted.

Research question 1:

1. How effective, efficient and satisfactory are the two MOOC platforms (Udemy and Coursera)?

Usability is determined by how well a characteristic adapts to the user's needs and environment. When users first encounter the interface, they should navigate it easily to achieve their goals without relying on outside knowledge and knowing how to use it. It should be as user-friendly as possible and lead the user down the most accessible and least challenging path. Therefore, it must be familiar with the user's environment, which requires considering their constraints, including the environment. Mainly the usability involves Navigation, Familiarity with the interface, consistency, error prevention, feedback to the user, visual clarity and Flexibility, and efficiency.

A system or product depends entirely on the particular and unique situation in which it is used, the nature of the task, how the user will perform it, and the equipment used. The usability of a system can be measured using observable and quantifiable usability metrics to achieve these three goals: Effectiveness, Efficiency, and Satisfaction level.

This research question results will be evaluated by taking the responses given by the users. The survey was conducted on fifteen users, and the results have been gathered.

Fifteen users were given eight tasks to be completed to experiment. The tasks were explained to the users by the authors, and the author noted each task's timings using a stopwatch on the phone while the user was performing the tasks on both MOOC platforms (Coursera and Udemy), respectively. The task timings of every participant for both MOOC platforms are tabulated and mentioned in Appendix A. The noted timing was converted into seconds(s).

Note: Tasks done by the users are on their respective electronic devices (laptops and mobiles), and the processing power and other internet issues were ignored.

The first task given to the user is to log in/ signup into the MOOC platforms, and the threshold value for the task1 for Coursera is 64.5s and for Udemy is 66.6s, where most of the users were able to complete the task within the threshold time. Few of them were not able to complete the task in time. Total successful tasks for task 1 in Coursera are 8 out of 15, and in Udemy, the successful tasks are 9 out of 15.

The second task given to the user is to search the specified course(Machine Learning)

in MOOC platforms. The threshold value for Coursera is 22.2s and for Udemy is 30.86s, where 12 out of 15 users could complete the task within the threshold time in Coursera, and in Udemy, 9 out of 15 completed the task in time.

The third task is to read the course content/ course information of the Machine learning subject on both platforms, and the threshold for this task in Coursera is 204.33s and in Udemy is 205.53s. 6 out of 15 users completed tasks in the time in Coursera and 9 out of 15 users completed tasks in time in Udemy.

The fourth task given to the user is to enroll in the course and play the introduction videos for solving the quiz. Here the threshold value for Coursera is 14s and for Udemy is 18. 9 out of 15 users completed tasks in Coursera, and in Udemy, only 5 out of 15 users were able to complete the tasks.

The fifth task is to complete the quiz given to the users based on the introduction videos. 8 out of 15 users completed tasks successfully in both MOOC platforms, where the threshold value for this task for Coursera is 294.53s and for the Udemy is 247.2s.

The sixth task is to update the profile or upload the user's picture and details on the respective platforms. The threshold time for task 6 in Coursera is 91.46s and for Udemy is 99.6s. In Coursera, 11 out of 15 users completed tasks within the threshold time, and in Udemy, 9 out of 15 users completed the task within the threshold time.

The seventh task given to the user is to see the notifications regarding the course enrolled on the platforms. The threshold value for Coursera is 27.8s, and for Udemy, it is 23.33s. 7 out of 15 users completed the task in Udemy; only 4 out of 15 people completed the task within the threshold time in Coursera.

The final task given to the users is to share the course on both platforms with their colleagues/ friends. The threshold value is 27.26s in Coursera, and Udemy is 31.73s. 12 out of 15 people completed the task within the threshold time on both platforms.

For calculating the Effectiveness, the above timing was taken into consideration. Effectiveness will be calculated by measuring the completion rate of the tasks given to the users by the total number of tasks undertaken.

$$\text{Effectiveness} = \frac{\text{Number of tasks completed successfully}}{\text{Total Number of tasks undertaken}} \times 100 \tag{6.1}$$

From the above formula, Effectiveness calculated for Coursera is 57.5% and for Udemy is 58.3%. Here Effectiveness of Udemy is better when compared to Coursera. Efficiency is calculated based on the successful tasks throughout the course, and it is measured by calculating the time taken by the user to complete the specific tasks.

$$\text{Efficiency} = \frac{\sum_{j=1}^{R}\sum_{i=1}^{N}\frac{n_{ij}}{t_{ij}}}{NR} \tag{6.2}$$

Where,
N is the number of tasks,

R is the number of users,

nij is the result of task I by user j

if the user completes the task, then nij=1 if not, nij=0

tij is the time spent by the user j to complete a task. If the task is not completed successfully, the time is measured until the user quits the task.

$$\text{Efficiency of Coursera} = 0.027\text{goals/sec.} \tag{6.3}$$

$$\text{Efficiency of Udemy} = 0.020\text{goals/sec.} \tag{6.4}$$

So from the above values, the Coursera and Udemy's efficiency is negligible. Task Satisfaction level is calculated by taking the Likert scale values of each task completed by the user. After completing the tasks, users were given a Likert scale table with an SEQ (Single ease questionnaire) for every task on both MOOC platforms.

The values of each user's satisfaction level with every task were taken. All the values were noted to calculate the task level satisfaction level and overall satisfaction level of the tasks given to the users. The repeated value of the Likert scale for all the tasks is taken. That value is multiplied by the number of repeated times and then divided by the number of users. It will give the satisfaction level of all tasks performed by every user; now, taking the average of each task satisfaction level gives the overall platform satisfaction level. All the calculations were mentioned in chapter 5.

For every task, the satisfaction level of all the participants was calculated. When the satisfaction levels were compared, Coursera and Udemy were 5.63 (Fairly easy) and 5.61 (Fairly easy), respectively. So the result is that both the Task level satisfaction of Coursera and Udemy are similar.

Research question 2:

How does the user experience of two major MOOC platforms (Coursera and Udemy) compare to each other?

This research question is explained by the results obtained from surveying the users. The results obtained from the users are evaluated statistically, to arrive at some conclusions.

The survey is conducted among the same fifteen users. In addition, this section explains the survey results in terms of relevant usability heuristics. The survey was conducted on the MOOC platforms Coursera and Udemy, and the users were given tasks to complete on the MOOC platforms.

Users were given an overview of the tasks defined on the MOOC platform. The user had to complete eight tasks on the MOOC platform. The user first selected one MOOC platform to do the task and to complete the same task on another platform. During the performance of the task, the user's task timings were recorded. After completing the tasks on the MOOC platform, the user was asked to complete

a questionnaire via a Google form provided by the author. Discussion about each survey question mentioned in chapter 4 is explained below.

Survey question 1 was used to know the user's familiarity with both MOOC platforms. By getting to know about the user's familiarity, the author can explain the tasks to be performed by the user to help the user know about MOOC platforms.

Survey question 2 was mapped with two usability heuristics: Visibility of system status and aesthetic and minimalist design. While registering into the MOOC platforms, password strength is shown when the password is entered. This type of feedback comes under the Visibility of system status, and both the Udemy and Coursera have this feature. A website must display relevant information with a minimalistic design that the user can easily understand. Coursera and Udemy have required information only while logging in or signing up.

Survey question 3 was mapped to recognition rather than recall, consistency, and standard. Recognition and recall are defined as if the user wants to search for a course in the search bar; the user should not have to remember each word of the search he/she makes because Coursera and Udemy both have the functionality to remember the previously searched results. In this question, consistency and standard mean the user should recognize the similar feature in the Coursera and Udemy compared to the standard features of other MOOC platforms, like having the same search option.

Survey question 4 was mapped to match between the system and the real world. The user is asked to enroll in the specified course and watch the introduction videos. The interface of the MOOC platforms (Coursera and Udemy) should match between its system and the real world, as the introduction part should be separated from the rest of the videos. Udemy and Coursera follow the Match between the system and the real world by having the introduction videos while enrolling in the course.

Survey question 5 was mapped to User control and freedom. Sometimes users may make mistakes and navigate to an unnecessary page and need to go back to the required page, where user control and freedom play a crucial role. A site should have clear marks on where the user is and where they can navigate by showing the selection in each menu. MOOC platforms (Udemy and Coursera) have this feature in their menus while playing any video.

Survey question 6 was mapped to the Visibility of system status and error prevention. While taking a quiz, the important thing is that the site should give feedback to the user on whether the answer is saved and submitted. This Visibility of system status is observed in both MOOC platforms. Error prevention is another important aspect where the user needs to be intimated to answer the quiz question and submit it. In Coursera, the submit button appears when the user answers every question displayed. In contrast, Udemy users need to answer or skip each question until the final submission button appears.

Survey question 7 was mapped to the Visibility of system status. The user task is to upload/update the profile picture of each MOOC platform. By the end of a task, the user needs to be notified about the update notification of the profile picture. There is no feedback in both MOOC platforms (Coursera and Udemy) as these platforms'

profile picture is included in the profile section, where the user needs to save the whole profile section to save the picture.

Survey question 8 was mapped to Match the system and the real world. Notifications are present on both MOOC platforms (Coursera and Udemy). The icon on these platforms represents similar icons as the other social media applications like Facebook and LinkedIn. It is easier to recognize the icon, and all the notifications of the course offer and the current pursuing courses on the MOOC platforms are displayed.

Survey question 9 was mapped to Flexibility and efficiency of use. Here the user's task is to share the course on both MOOC platforms. Getting to know the user interaction while sharing the course allows the user efficient use and Flexibility of sharing the course with others like many other social networks (Whatsup, Facebook). It is easier to get acquainted with the functions of the interface so that the MOOC platform's efficiency can be determined.

Survey question 10 is mapped to help and documentation. Most of the time, users do not need any guidance or help for the tasks performed. However, documentation is needed if any problem is developed and the user needs guidance. It may be necessary to provide the help and documentation. It helps the users with easy navigation to focus on the task that needs to be done.

Survey question 11 was mapped to help users recognize, diagnose and recover from errors. For any user, if any error occurs, an error message should appear so that the user can rectify the mistake and continue the tasks to be performed with the help of indicating the problem by suggesting a solution.

Survey question 12, Survey question 13, and Survey question 14 were developed to understand user skills. It helps the authors know the user's knowledge and computer skills while performing the tasks.

respondents.

Survey question 15 is the overall experience of the user on Coursera. Variance and standard deviation were calculated from the results collected from the users. 0.62 and 0.78 are the Variance and standard deviation of Coursera, respectively.

Survey question 16 is the overall experience of the user on Udemy. Variance and standard deviation were calculated by collecting results from the user. 2.38 and 1.54 are the Variance and standard deviation of Coursera, respectively.

Variance :

$$Variance = \sigma^2 = \sum_{i}^{N} (m_i - \mu)^2 / N$$

Where,
m_i is value of each task
μ is mean value of all tasks
N is total number of tasks

Standard Deviation :

$$StandardDeviation = \sigma = \sqrt{\sum_{i}^{N}(m_i - \mu)^2/N}$$

Comparing the variance and standard deviation of the MOOC platforms, Udmey has more variance and standard deviation than the Coursera in terms of the users' overall experience.

Chapter 7

Conclusions and Future Work

7.1 Conclusions

This study answers the question of which MOOC platform among Coursera and Udemy has a better user experience by using two different approaches. The first approach is to calculate both MOOC platforms' effectiveness, efficiency, and satisfaction level (Coursera and Udemy). For this, specific tasks were given to the fifteen equally skilled people and asked to perform the tasks, and the time taken to finish each task by each user was noted. These timings are tabulated, and the threshold value is calculated. The threshold value is used to calculate each MOOC platform's effectiveness and efficiency.

A Single Easy Questionnaire (SEQ) method is used, where a Likert scale rating for each task by each individual is noted. The repeated values of the Likert scale are used to calculate the satisfaction level of each MOOC platform.

The second approach calculated the variance and standard deviation using the survey evaluation results. For this, users were given a questionnaire-based survey where each question is mapped against the heuristic principles to evaluate the user experience of both MOOC platforms (Coursera and Udemy). The survey respondents are the same users who had performed each task to calculate the effectiveness, efficiency, and satisfaction level. By this approach, Udemy has more variance and standard deviation compared to the Coursera.

This study concludes that Coursera and Udemy's effectiveness, efficiency and satisfaction level are comparatively similar. However, from the survey results considering user experience, users have chosen Udemy over Coursera.

7.1.1 Future Work

For future work, this study can be explored in various ways like

- One can also use HCI design principles to compare MOOC platforms.
- Comparative usability evaluation can be performed on other MOOC platforms like Edx, Udacity, and Khan Acadamy.
- This study can be extended to paid MOOC platforms like LinkedIn learning.
- The survey can be conducted on large number of users.

- This study can be extended to other evaluation methods like Interviews, Cognitive walkthrough, and pluralistic walkthrough.

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Appendix A

Appendix

This section is about each participant's time for finishing the tasks given to them in both Coursera and Udemy. NOTE: In task 4, time is recorded only for the enrollment of the course and time for playing the introduction videos was not included because for Coursera time for introduction videos is 33 min and in Udemy it is 25min.

Tasks	Coursera	Udemy
Task1	15s	67s
Task2	38	41
Task3	108	141
Task4	16	19
Task5	257	166
Task6	147	159
Task7	33	12
Task8	76	88

Table A.1: Time taken (in sec) by participant 1 for finishing each task

Tasks	Coursera	Udemy
Task1	18	63
Task2	19	40
Task3	187	180
Task4	10	15
Task5	264	181
Task6	107	62
Task7	34	57
Task8	12	28

Table A.2: Time taken (in sec) by participant 2 for finishing each task

Tasks	Coursera	Udemy
Task1	14	10
Task2	39	41
Task3	242	145
Task4	15	22
Task5	317	166
Task6	171	209
Task7	31	10
Task8	121	80

Table A.3: Time taken (in sec) by participant 3 for finishing each task

Tasks	Coursera	Udemy
Task1	60	64
Task2	20	30
Task3	187	242
Task4	12	19
Task5	344	340
Task6	84	61
Task7	32	45
Task8	10	25

Table A.4: Time taken (in sec) by participant 4 for finishing each task

Tasks	Coursera	Udemy
Task1	15	67
Task2	38	41
Task3	108	141
Task4	18	21
Task5	257	166
Task6	147	159
Task7	33	12
Task8	76	88

Table A.5: Time taken (in sec) by participant 5 for finishing each task

Tasks	Coursera	Udemy
Task1	81	73
Task2	21	34
Task3	247	226
Task4	13	18
Task5	256	351
Task6	81	121
Task7	31	24
Task8	20	23

Table A.6: Time taken (in sec) by participant 6 for finishing each task

Tasks	Coursera	Udemy
Task1	62	56
Task2	20	29
Task3	243	302
Task4	16	20
Task5	345	289
Task6	74	61
Task7	31	25
Task8	11	24

Table A.7: Time taken (in sec) by participant 7 for finishing each task

Tasks	Coursera	Udemy
Task1	80	59
Task2	20	59
Task3	188	226
Task4	20	22
Task5	286	351
Task6	72	59
Task7	21	25
Task8	10	20

Table A.8: Time taken (in sec) by participant 8 for finishing each task

Tasks	Coursera	Udemy
Task1	62	56
Task2	20	29
Task3	248	302
Task4	10	21
Task5	345	289
Task6	74	61
Task7	31	25
Task8	11	24

Table A.9: Time taken (in sec) by participant 9 for finishing each task

Tasks	Coursera	Udemy
Task1	85	54
Task2	21	30
Task3	242	184
Task4	13	18
Task5	236	161
Task6	71	94
Task7	12	15
Task8	10	15

Table A.10: Time taken (in sec) by participant 10 for finishing each task

Tasks	Coursera	Udemy
Task1	54	71
Task2	20	23
Task3	135	141
Task4	14	19
Task5	341	242
Task6	81	144
Task7	30	20
Task8	10	9

Table A.11: Time taken (in sec) by participant 11 for finishing each task

Tasks	Coursera	Udemy
Task1	116	102
Task2	14	21
Task3	243	186
Task4	15	19
Task5	301	292
Task6	65	64
Task7	31	24
Task8	10	13

Table A.12: Time taken (in sec) by participant 12 for finishing each task

Tasks	Coursera	Udemy
Task1	92	102
Task2	21s	17
Task3	244s	272
Task4	16	10
Task5	276	222
Task6	65	116
Task7	34	25
Task8	10	12

Table A.13: Time taken (in sec) by participant 13 for finishing each task

Tasks	Coursera	Udemy
Task1	102	100
Task2	12	15
Task3	222	194
Task4	10	15
Task5	291	221
Task6	62	65
Task7	21	15
Task8	10	12

Table A.14: Time taken (in sec) by participant 14 for finishing each task

Tasks	Coursera	Udemy
Task1	112	65
Task2	10	13
Task3	221	201
Task4	12	14
Task5	302	271
Task6	71	59
Task7	12	16
Task8	12	15

Table A.15: Time taken (in sec) by participant 15 for finishing each task

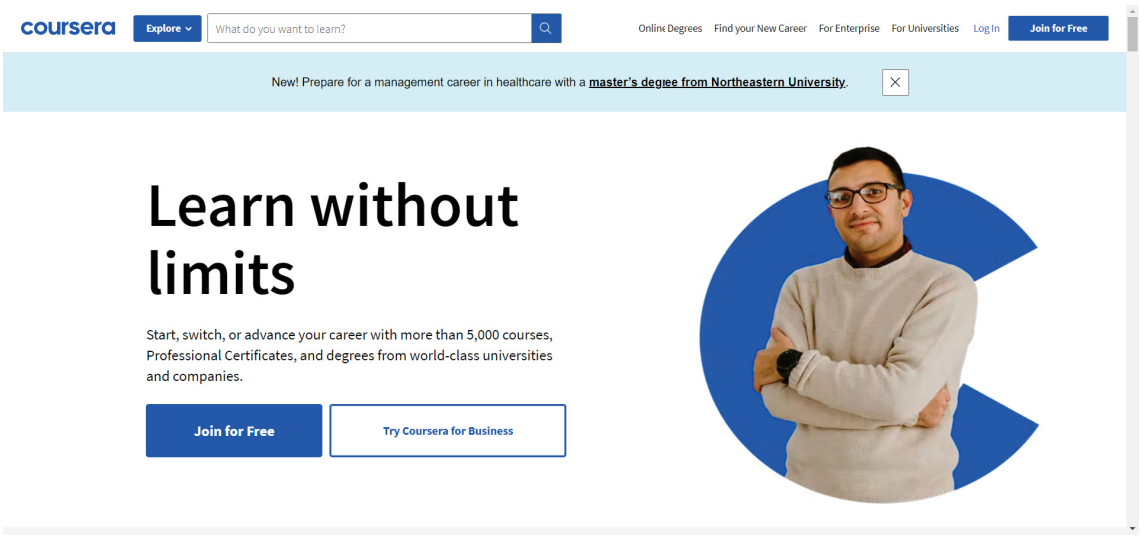
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Figure A.1: Coursera User Interface

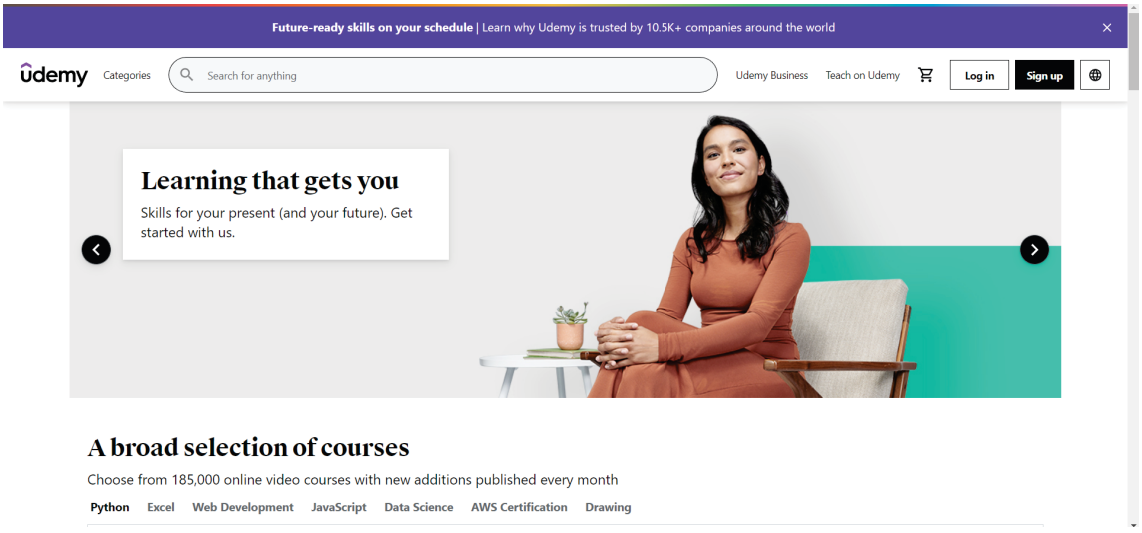

Figure A.2: Udemy User Interface

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